



IEEE

IEC 62843

Edition 1.0 2013-01

# INTERNATIONAL STANDARD

IEEE Std C37.94™

Standard for N times 64 kilobit per second optical fiber interfaces between  
teleprotection and multiplexer equipment

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IEC 62843:2013

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INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE

R

ICS 33.200

ISBN 978-2-83220-566-2

**Warning! Make sure that you obtained this publication from an authorized distributor.**

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# STANDARD FOR N TIMES 64 KILOBIT PER SECOND OPTICAL FIBER INTERFACES BETWEEN TELEPROTECTION AND MULTIPLEXER EQUIPMENT

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The text of this standard is based on the following documents:

| IEEE Std    | FDIS         | Report on voting |
|-------------|--------------|------------------|
| C37.94-2002 | 57/1258/FDIS | 57/1290/RVD      |

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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# IEEE Standard for N Times 64 Kilobit Per Second Optical Fiber Interfaces Between Teleprotection and Multiplexer Equipment

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Approved 21 January 2003

**American National Standards Institute**

Approved 12 September 2002

**IEEE-SA Standards Board**

**Abstract:** An optical interface for use between teleprotection and digital multiplexer equipment that can operate at a data rate of N times 64 kilobit per second where N = 1, 2...12 is described. Requirements for both physical connection and the communications timing are also included.

**Keywords:** alarm indication signal, bit error rate, cyclic redundancy check, loss of frame, loss of signal, multimode optical fiber, multiplexer, remote defect indication, teleprotection, unit interval

## IEEE Introduction

(This introduction is not part of IEEE C37.94-2002, IEEE Standard for N times 64 Kilobit per Second Optical Fiber Interfaces between Teleprotection and Multiplexer Equipment.)

Existing interface standards between teleprotection equipment and multiplexers are electrical only. These low-energy signal interfaces are susceptible to intra-substation electromagnetic interference (EMI). The use of dedicated optical fibers for the intra-substation communication links between teleprotection equipment and multiplexers eliminates the data corruption common to electrical connections.

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# Standard for N Times 64 Kilobit Per Second Optical Fiber Interfaces Between Teleprotection and Multiplexer Equipment

## 1. Overview

### 1.1 Scope

This standard describes the interconnection details for N, where  $N = 1, 2, \dots, 12$ , times 64 kilobit per second connections of teleprotection equipment to digital multiplexers using optical fiber. Requirements for both physical connection and the communications timing are also included.

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### 1.2 Purpose

The purpose of this standard is to allow the interconnection of different vendors' teleprotection equipment with different vendors' multiplexer equipment, without any restriction on the content of the N times 64 kilobit per second data using up to 2 km of 50 or 62.5 micrometer multimode optical fiber.

## 2. References

The following standard contains provisions, which through reference in this text constitute provisions of this standard. At the time of this publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of the IEC and ISO maintain registers of currently valid International Standards.

IEC-60874-10-1 (1997-06) Connectors for optical fibres and cables— Part 10-1: Detail specification for fibre optic connector type BFOC/2.5 terminated to multimode fibre type A1.<sup>1</sup>

<sup>1</sup>IEC publications are available from the Sales Department of the International Electrotechnical Commission, Case Postale 131, 3, rue de Varembe, CH-1211, Genève 20, Switzerland/Suisse (<http://www.iec.ch/>). IEC publications are also available in the United States from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.

### 3. Definitions and acronyms

#### 3.1 Definitions

For the purposes of this standard, the following terms and definitions apply. *The IEEE Authoritative Dictionary of IEEE Standards Terms*, Seventh Edition [B2]<sup>2</sup>, should be used for terms not defined in this clause.

**3.1.1 jitter:** A term used to describe perturbations in the timing of data bit transitions when the frequency of the perturbations is greater than 10 Hz.

**3.1.2 multimode optical fiber:** An optical fiber that has a relatively large core, in which light bounces off the walls of the core. This results in multiple signal paths through the fiber, which limits the maximum signaling rate more and more as the fiber length increases.

**3.1.3 multiplexer equipment:** A device that allows the transmission of a number of different signals simultaneously over a single channel or transmission facility.

**3.1.4 teleprotection equipment:** Equipment that provides the interface between the protective relay and a communications circuit.

**3.1.5 unit interval (UI):** Time duration equal to the reciprocal of the bit rate.

**3.1.6 wander:** A term used to describe perturbations in the timing of data bit transitions when the frequency of the perturbations is less than 10 Hz.

#### 3.2 Acronyms

|     |                          |
|-----|--------------------------|
| BER | bit error rate           |
| CRC | cyclic redundancy check  |
| LOS | loss of signal           |
| LOF | loss of frame            |
| ppm | parts per million        |
| RDI | remote defect indication |

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### 4. Frame structure

The frame structure is designed to allow the passage of information in packet format from the multiplexer to the teleprotection equipment and from the teleprotection to the multiplexer equipment. The format was chosen so:

- a) The frame is a valid International Telecommunications Union (ITU-T) recommendation G.704 pattern from the standpoint of framing and data rate. However, the data structure is not a standard data format.
- b) The bit pattern would have approximately equal ones and zeroes (for transmission through ac-coupled optical circuits).
- c) The frame would have an easily detected bit pattern for frame synchronization.
- d) The frame structure is identical in both directions. The frame is the same size and format regardless of the number of 64 kilobit per second timeslots being utilized.

<sup>2</sup>The numbers in brackets correspond to those in the bibliography in Annex C.